13.3.2. Initial Considerations for Sampling Wetland Invertebrates

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As the importance of invertebrates to waterbird nutrition and detrital processing has become increasingly evident, the need for effective and efficient invertebrate sampling has grown. Identification of invertebrate responses to management requires sampling and selection of appropriate sampling equipment. Goals must be established according to qualitative or quantitative needs, organism characteristics, and wetland types. Management objectives often can be met by sampling specific invertebrates to index the effect of management rather than through long-term studies requiring large sample sizes and intensive effort. Certain wetland and invertebrate characteristics that should be considered when initiating invertebrate sampling are described below.

Identification of Goals

The initial consideration in any collection of management data is how these data will facilitate more effective management. In most wetland management situations, the first step toward evaluating invertebrate populations is identification of dominant organisms. This can be accomplished by a qualitative approach using simple techniques and relatively few samples. In contrast, when comparisons of sites, techniques, or seasonal and annual variations are desired, quantitative methods are necessary and require more time and effort. Invertebrate communities can be measured using organism occurrence (presence or absence), density (number of organisms per area), and biomass (weight per sample or area). Species diversity, which embraces number and relative abundance of the species, is also commonly used for comparative purposes when monitoring different wetland sites.

Before a biologist can successfully assess invertebrate responses to management, the appropriate taxonomic classification for target species must be identified. The effort required to identify aquatic invertebrates to genus or species is often unnecessary for management purposes. However, grouping invertebrates above the family level may be too broad a classification to identify the functional roles of the organisms within the wetland system or their life history strategies. In general, identification to family is usually adequate for management studies, whereas identification to genus may be appropriate for research endeavors.

Organism characteristics should be considered when developing sampling regimes. Life history considerations should include type and timing of various developmental stages. Invertebrate survival generally drops rapidly during early age classes (Fig. 1). Because of this characteristic, managers should not become alarmed when observing temporal declines in total numbers within a species. Likewise, year-to-year comparisons should be conducted at approximately the same period in an annual cycle.

A good sampling design requires recognition of varying physical parameters of the wetland and water regime. Stream and lake systems usually are sampled in different ways. Extremes in water depth during the annual water regime may dictate the type of sampling gear that will be most effective (Table 1). Where benthos are sampled, substrate type influences choice of equipment. Density and structure of vegetation influence water column sampling. For example, sturdy, emergent vegetation may prevent effective sampling with a sweep net, whereas activity traps can be used effectively in these vegetated zones.

Sampling Technique

The effectiveness of common sampling apparatus in different invertebrate habits is outlined in Table 1. Benthos samplers include dredges and core samplers. Core samplers are extremely effective and inexpensive and can be small and light weight. Core samplers may be made from light-weight PVC pipe, and plastic or metal edges can be added to cut roots or crusted soils. Dredges are poor choices in

Table 1. *The advantages and disadvantages of sampling apparatus for wetland invertebrates.*

Microhabitat	Apparatus	Advantages	Disadvantages
Benthos sediments	Ekman dredge, Ponar dredge	Good for deep water sampling from boat, where bottom sediments are soft	Ineffective in vegetation zones or rocks Difficult to carry Expensive
	Stovepipe sampler	Good for deep sediment samples in moderate water depths	Heavy, difficult to carry in field Expensive
	Core sampler	Can be used effectively in diversity of habitats Volume/depth of sampling easily modified by design Lightweight, inexpensive	Must use with SCUBA in deep water
Water column	Column sampler	Can sample both water column and sediments	May require long field time for small sample size Awkward to carry Expensive
	Sweep net	Provides area-density estimate Lightweight, easy to carry in field Inexpensive	Variation between collectors Difficult to use in dense, robust vegetation
	Activity trap	Standardized procedure Reduced field time Provides samples free of plant/detrital material	Does not give area-density index Predation in traps by fish and invertebrates Passive sampler—may underestimate sedentary organisms
Aerial	Emergence traps	Quantified sample Density estimates	Requires trap construction and maintenance
	Light traps	Time index Ability to collect large qualitative samples	Not an area-density index Mainly nocturnal trap
	Aerial sweep net	Qualitative samples Inexpensive	Not an area-density index Biased sampling
Shoreline	Core samplers	Area-density for semi-aquatic/terrestrial invertebrates Inexpensive	
	Activity traps/ mesh bags	Good time index for mobile invertebrates Good in leaf-based detritivore systems	Passive trap Need to continually move trap in dynamic system Expensive

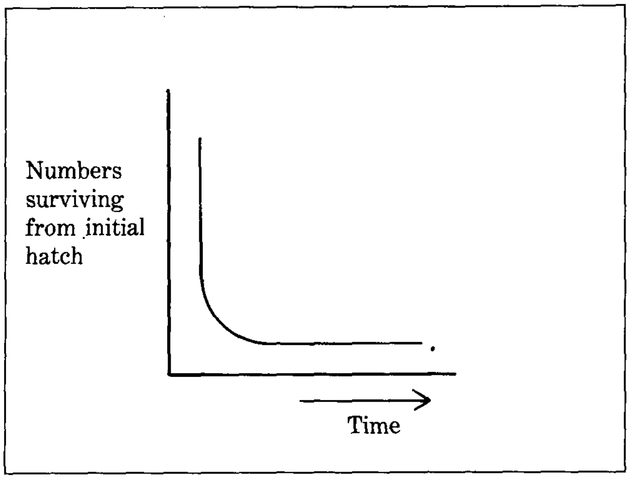

Figure 1. Type III survival curve—typical survival for most aquatic invertebrate populations.

vegetated zones because the springs are usually activated before reaching the sediments, or the jaws will not close sufficiently to contain the entire sample. Nevertheless, in some deep-water areas they offer an acceptable approach. Stovepipe samplers have been used effectively for benthos, but they are often cumbersome for field work. Samples from all these apparatus may be washed through standard sieves to eliminate mud and roots.

Water column samplers include tubular column samplers, sweep nets, and activity traps. Column samplers are expensive and do not work well when submergent vegetation is sampled. Sweep nets are easily manipulated, and field time can be decreased if net inserts are used. Net inserts are constructed of fine netting. These inserts are secured in the larger, coarse net, removed after each sweep, placed in a plastic, zip-lock bag, and transported to the lab. Another insert is used for the next sweep. If more than one technician is available, activity traps may be used for sampling, but those traps are expensive and time-consuming to use. Aerial samples may be collected with quantifiable emergence traps, with qualitative light traps, or with sweep nets. Shoreline samples may be collected with core samples or with replicate mesh traps. Manpower, time investment, and technical expertise must be considered when developing sampling schemes. Diversity among wetlands and their invertebrate communities may require complex sampling methods (Table 2). Field collections for quantitative sampling demand a relatively small amount of time compared to the investment required for sorting, identification, and analysis (Fig. 2).

The techniques listed here provide a framework for sampling. More specific sampling gear can be constructed for the needs of a specific study, but standardization for comparison among other regions is also desirable. Sampling of wetland invertebrates can be conducted for broad qualitative surveys, site or treatment comparisons, or as a long-term index. The needs for long-term sampling should be continually reappraised as long-term management goals are modified.

Table 2. *Examples of potential apparatus selection based on wetland type and project goal.*

Wetland habitat	Project goal	Considerations*	Potential apparatus
Seasonally flooded, annual grasses dominant	Compare general invertebrate fauna associated with dominant plant type	Need index	Sweep net/activity traps
Seasonally flooded, annual grasses dominant	Document peak hatch of midges/ mayflies for potential swallow predation	Need to capture emerging subadults	Emergence traps
Semipermanent, cattails dominant	Compare general invertebrate fauna under varying water regimes	Need index Robust vegetation	Activity traps
Seasonally flooded, pin oak forest	Compare general invertebrate fauna between two greentree reservoirs	Twig/leaf material as substrate	Activity traps/mesh bags
Lacustrine beach	Sample potential foods of a shorebird species	Sample location of feeding birds May include terrestrial environments	Core sampler and sticky traps
Deep, large river	Sample clam population in diving duck feeding area	Deep water, current, and soft substrate	Ponar/Ekman dredge

*Viable replication is a concern in each sample.

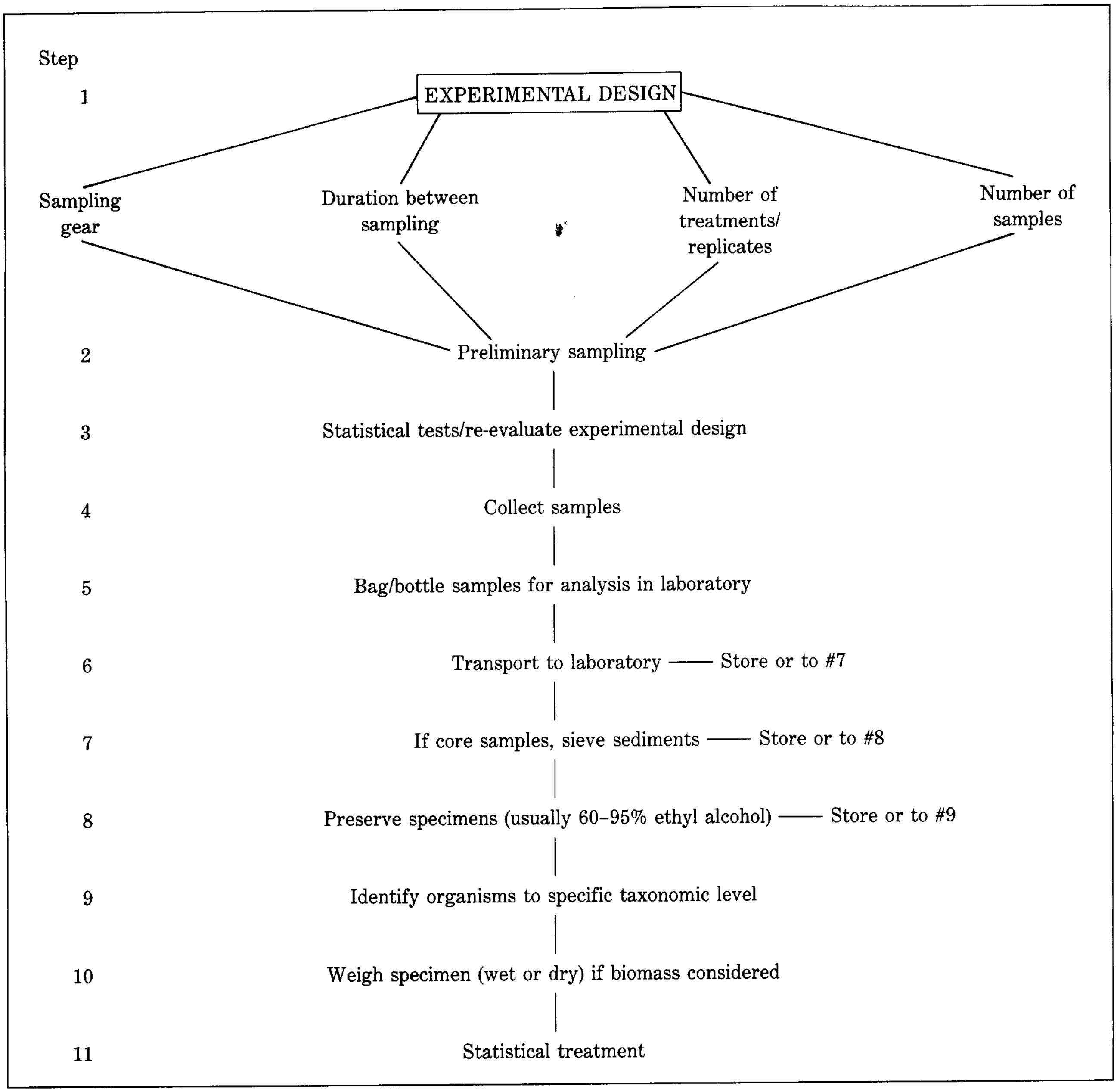

Figure 2. Chronology of steps in wetland invertebrate sampling.

Suggested Reading

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